DOCUMENT RESUME

ED 406 146 SE 059 796

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TITLE Assessing the Impact of an Urban Systemic Professional Development Program on Classroom Practice.
PUB DATE Mar 97
NOTE 32p.; Paper presented at the Annual Meeting of the National Association for Research in Science Teaching (Oak Brook, IL, March, 1997).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Constructivism (Learning); Curriculum Development; Delivery Systems; Educational Change; Elementary Secondary Education; Learning Theories; Mathematics Education; *Professional Development; Science Education; Strategic Planning; Teaching Methods; *Urban Schools
IDENTIFIERS *Detroit Public Schools MI

ABSTRACT

The challenges faced by urban schools as they aspire to reform science education are immense. Under the auspices of the National Science Foundation through the Urban Systemic Initiative, teachers and administrators throughout the Detroit (Michigan) Public School system have been deeply involved in a wide array of professional development activities. Although there are many components to the Detroit Urban Systemic Initiative (DUSI), the infusion of extensive professional development opportunities holds great promise to make an impact on positive classroom practice. Systemic Evaluation of the DUSI is multifaceted and targets a variety of outcomes. This study focused on the impact of DUSI professional development activities on actual classroom practice. Data were collected using a variety of methods, including staff development observations, student and teacher surveys, school team case studies, and reports from teacher and administrator focus groups. Evaluation of professional development activities revealed that the overall program was of high quality and tightly aligned with constructivist teaching and learning practices. Results indicated that teachers reported a significant increase in implementing constructivist teaching and learning practices that can be attributed to involvement in DUSI professional development activities. Contains 40 references. (Author/PVD)

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ED 406 146

Assessing the Impact of an Urban Systemic Professional Development Program on Classroom Practice

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Paper Presented at the Annual Meeting of the
National Association for Research in Science Teaching
Oak Brook, Illinois
March, 1997

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Abstract

The challenges faced by urban schools as they aspire to reform science education are immense. Under the auspices of the National Science Foundation, through the Urban Systemic Initiative (USI), teachers and administrators throughout the Detroit Public School system have been deeply involved in a wide array of professional development activities. Although there are many components to the Detroit Urban Systemic Initiative (DUSI), the infusion of extensive professional development opportunities holds great promise to positively impact classroom practice. Systemic Evaluation of the DUSI is multi-faceted and targets a variety of outcomes. This study focused on the impact of DUSI professional development activities on actual classroom practice. Data was collected using a variety of methods including staff development observations, student and teacher surveys, school team case studies, and reports from teacher and administrator focus groups. Evaluation of professional development activities revealed that the overall program was of high quality and tightly aligned with constructivist teaching and learning practices. Results indicated that teachers reported a significant increase in implementing constructivist teaching and learning practices that can be attributed to involvement in DUSI professional development activities.

Introduction

As a result of an abundance of national and international reports on the science achievement of the nation's youth (Jacobson & Doran, 1991; Mullins & Jenkins, 1988; National Commission on Excellence in Education, 1983), science educators are in the midst of large scale reform efforts. The challenges faced by urban schools as they aspire to reform science education are immense. Under the auspices of the National Science Foundation, through the Urban Systemic Initiative (USI), teachers and administrators throughout the Detroit Public School system have been deeply involved in a wide array of professional development activities. Researchers and professional developers in science education recognize that teachers and administrators are often bombarded with new ideas and are in need of sustained, high quality professional development (Haney & Lumpe, 1995; Holmes, 1986, 1995; MAA, 1991; NCR, 1996; NCTM, 1989, 1991; Raizen & Miachelsohn, 1994; Shroyer, Wright, & Ramey-Gasser, 1996). Furthermore, the likelihood of professional development experiences positively impacting classroom teaching and learning will increase with the development of collegial support (Dlugosh, 1993; Donivan, 1993; Keys and Golley, 1996; Ramirez-Smith, 1995; Sparks & Loucks-Horsley, 1990; Tippins, 1993; Weir, 1992). Many urban, state, and national reform efforts are looking for ways to scale up to meet current professional development needs. At the same time, there is a need to develop collegial support at the building level in order for reform to take place. The DUSI professional development system targets and supports these two objectives and may serve to provide other staff developers with ideas to support their efforts. This paper provides an overview of the evaluation of the professional development component of the Detroit Urban Systemic Initiative (DUSI) and its impact on classroom teaching and learning.

Background

The Detroit Urban Systemic Initiative (DUSI) commenced with the implementation of a vision for totally reforming the teaching and learning in mathematics and science education. The vision is articulated in the classroom through changes in major systems including curriculum, delivery systems, professional development, community involvement, and organization and structure.

From the beginning, DUSI determined that changes made as a result of its work would be system-wide and of major consequence in totally reforming mathematics

and science. Understanding the enormous challenges of a large urban district, the DUSI developed a tiered process for implementation over the five-year USI grant period. The first tier of three constellations began the process in 1994-95. Tier II followed the next school year, adding six constellations and three alternative schools. This year, the final tier began the process with fourteen constellations and six alternative schools. Thus, the scaling up process was planned to engage all schools beginning in 1996-97 and to have full implementation in all schools beginning in 1998-99.

Theoretical Framework

The Detroit Urban Systemic Initiative (DUSI) has been structured to connect with classroom teachers in direct and strategic ways. One of the first activities at the onset of the DUSI involved creating a document which articulated principles of teaching and learning that might ultimately improve student understanding and achievement. This document, *A Constructivist Vision Towards Teaching, Learning, and Staff Development* (Stein, et. al., 1994), has served to inform administrators, teachers and staff of the DUSI vision for improvement by outlining the concepts and practices in a new approach to mathematics and science education. A key challenge in large urban districts is to help all stakeholders understand and work toward common goals. This constructivist vision document has served as a template for professional developers and school teams as they plan for future activities. The nine principals outlined in the document are:

- Each student must actively construct her or his own meaning in order to understand the material being learned.
- Learning depends on the previous understandings that students bring to the learning situation.
- What, and how much, is learned depends on the context in which it is learned.
- What is learned depends on the shared understandings that students negotiate with the teacher and with each other.
- Constructivist teaching involves meeting students "where they are" and helping them move to higher levels of knowledge and understanding.
- Teachers can use specific teaching methods to facilitate students' active construction of knowledge.
- In constructivist teaching, the teacher emphasizes "learning-how-to-learn."
- The constructivist teacher uses continuous assessment to facilitate learning.
- Constructivist teachers are themselves constructivist learners.

In order for DUSI reform efforts to succeed, it has not only been important for teachers to understand DUSI goals, but also for teachers to articulate their own ideas about teaching and learning and to think about changes that are needed for success. Several researchers support the idea that teacher beliefs are precursors to change and that the teacher is the crucial change agent in paving the way to reform (Ajzen & Fishbein, 1980; Crawley & Koballa, 1992; Cuban, 1979; Fullan & Miles, 1992; Jenlink, 1995). Additionally, some researchers have noted that previous attempts at science reform fell short of successful change because they were not systemic in nature and often embodied a top-down model of change (Anderson & Mitchener, 1994; Bybee & DeBoer, 1994; Cuban, 1990; Fullan & Miles, 1992; Gordon, 1993; Sashkin & Egermeirer, 1992).

A study by Haney, Czerniak, and Lumpe (1996) further articulated the importance of teacher beliefs on changes in practice:

> "In other words, teacher perceived outcomes regarding the behavior at hand and the likelihood that these outcomes will occur to be major influences on behavioral intention; therefore, contemporary reform cannot afford to ignore the importance of such beliefs. . . . The obstacles and enablers that the teachers were provided mattered less to them than did their beliefs about the positive and negative outcomes associated with the behavior. This finding suggests that teacher training should pay particular attention to the attitudes teachers have toward behavior before alterations of control factors (such as providing curriculum materials, reducing class size, including flexible class scheduling, etc.) are expected to lead to lasting changes in classroom practice." (p. 985)

Although targeting teacher belief systems may be viewed as critical to change, there are many other obstacles that may impede progress. Sparks (1994) made recommendations for effective, sustained, high quality staff development. Among the recommendations that were interwoven into the design and format of the professional development experiences were:

- Keep the focus on student learning.
- Recognize that change affects staff members in personal ways.
- Change the organization's culture at the same time that individual teachers and administrators are acquiring new knowledge and skills.
- Use a systems approach to change.
- Apply what is known about the change process to the improvement effort.
- Recognize the subtle tension between the importance of establishing readiness for change and the need to get people to try out new practices.
- Provide content-specific staff development that addresses both deeper forms of content knowledge and instructional strategies most effective in that discipline.

- Make certain that learning processes for teachers model the type of instruction that is desired.
- Provide generous amounts of time for collaborative work and various learning activities.

Support Structure

Teachers are introduced to the (DUSI) goals and philosophy through "Articulation Sessions." These meetings, initiated as a constellation enters the first year of DUSI, bring together mathematics and science teachers from all schools in a constellation and serve to open communication lines, foster cooperation between schools, provide staff development, and initiate partnering activities for students and teachers. In addition to this new collegiality and camaraderie between teachers, specialists have become well-prepared to support new standards and pedagogy. At the elementary level, specialists in mathematics and science teach those subjects in grades three-five and teacher leaders are developed within the school to support the classroom teachers. Specialists also assist teachers of kindergarten through second grade as they undergo and begin to utilize intensive training to shift from rote teaching to teaching for higher level thinking skills. At the secondary level, Unit heads (middle school level) and Department heads (high school level) have been trained to assist mathematics and science teachers in constructivist teaching approaches through implementation of the Detroit Public Schools (DPS) Core Curriculum. The Core Curriculum outcomes were written to align with state and national science and mathematics standards.

Supporting teachers in direct contact with students is a structure of specialists in six geographical "Areas" as well as at the district level. These persons, who have strong backgrounds in mathematics and/or science and have received intensive training in the DPS Core Curriculum, serve as resources in content as well as pedagogy to the elementary specialists, unit heads, department heads, and classroom teachers.

Curriculum

An enormous amount of effort has been invested in aligning and articulating the Detroit Public Schools' curriculum in mathematics and science. The district demonstrated its commitment to core curriculum through the allocation of 4.6 million dollars for mathematics and science.

Materials have been organized, adopted, implemented, and customized at all levels of the system. Tier 1 schools have provided valuable feedback that has been used to improve materials and adoptions in the Tier 2 and Tier 3 schools. Materials developed by DPS include curriculum guides, core curriculum outcomes, core objectives (for courses), pacing charts (for courses), parents' guides to core curricula by grade level and subject, math activity calendars to sequence essential skill-building, and workbooks for assuring coverage of models and vocabulary at different grade levels that are assessed through the Michigan state evaluation program (MEAP). A number of other written works also support the new curriculum including a student handbook for science fair projects and compilation of summer program activities based on essential skills.

Professional Development

The professional development (PD) programs in mathematics and science grow out of major initiatives in the district including the Dwight D. Eisenhower Math and Science Program, the Michigan Mathematics and Science Centers Program, and the Michigan Statewide Systemic Initiative. All professional development is influenced by Michigan Public Act 25 and includes alignment with School Improvement Plans, the national and state standards in Mathematics and Science, and state standards for Professional Development. Using these inputs, the district develops its PD programs and coordinates its PD plan through a Professional Development Council.

Professional Development connected to DUSI is based on the assumption that PD is essential to school development and should be context-bound. Because teachers learn as a result of training, practice, feedback, individual reflection, and study groups, the district has assembled an array of professional development experiences that work in congruence to train classroom teachers in effective mathematics and science education. Opportunities include university courses, district inservice training, statewide inservice networks, peer coaching, Area inservice initiatives, and mini-grant programs. Study groups are a new initiative in the district as are the use of case studies in PD. Unit heads meet together by Area to plan building-level sessions and the leadership of their areas.

A key component of DUSI professional development has been a summer institute developed to target constructivist teaching and learning principles. During the institute, school teams of science and mathematics teachers and administrators engaged in a variety of program activities designed to help them to understand constructivism and form supportive communities of learners as they discussed their understandings and developed future plans. It was thought that institute participants who were immersed in a constructivist environment, would have opportunities to confront their own beliefs about teaching and learning and implement changes at the classroom and school levels (Deighan, 1992). Furthermore, the institute was designed to encourage collaboration, the sharing of ideas, and the development of teacher support systems. It is believed that teacher belief systems are significant factors in motivating a change in teaching behavior and that previous reform efforts largely ignored the influential nature of teacher beliefs and their effect on instructional practice (Tobin, Tippins, & Gallard, 1994).

As part of PD efforts, teachers and administrators were asked to use journals as a means to reflect on practice. Teachers in certain PD programs (such as M2IP) used the journals as part of the week-to-week process of improving practice by asking questions like "What went on today? How did the students respond? What did I observe? How can I improve?" Thus, professional development in Detroit has gone beyond attendance at organized sessions. Teachers who are further along in changing their teaching practices are able to suggest what's needed and work through the logistics of making it happen. But for most of the teachers, a supportive, ongoing PD program is necessary.

Community Involvement

The DUSI has received wide-spread recognition and support. The initiative has been highlighted twice during the Superintendent's weekly cable program, "Education Update, that is used to report school district concerns and progress to the community at large, and has also been presented in the district's Opportunities Forum and weekly radio program. Detroit Public Schools' vision of mathematics and science education requires not only teachers' implementation of the core curriculum and appropriate pedagogy, but also recognizes and supports the involvement of parents and other community members in the educational process. Family Mathematics and Family Science exemplify the link between home and school considered essential to

the realization of the vision. Detroit's Michigan Statewide Systemic Initiative (MSSI) Focus District grant has emphasized this area and made significant contributions to the overall system by complementing the work of the Urban Systemic Initiative.

To date, the district has provided training to 99 leadership teams of teachers, parents, and administrators to build the capacity of the district to support parents as they provide assistance in the school improvement efforts.

Method

Systemic evaluation of major initiatives is multi-faceted and complex. The focus of this paper is on the evaluation of the Detroit Urban Systemic Initiative (DUSI) professional development program and its impact on classroom practice. Quantitative and qualitative methodologies were used to collect data across a range of programs and target groups. Data sources included:

- Staff Development Observations
- Teacher Surveys
- Student Questionnaires
- Focus Groups with Teachers and Unit/Department Heads
- Summer Institute Surveys
- Case Studies of School Teams

The theoretical foundation for professional development in the district was described by the aforementioned DUSI vision document "A Constructivist Vision for Teaching, Learning, and Staff Development" (Stein, et. al., 1994). Along with developing a professional development program that targeted the guiding principles outlined in this document, individual presenters and consultants were required to align their presentations to model constructivist teaching and learning. Thus, the extent to which constructivist teaching and learning practices were modeled, understood, and implemented in the district was an integral component of the evaluation. The major components of the evaluation of the professional development program of the Detroit Urban Systemic Initiative (DUSI) are described below.

Staff Development Observations

During the Winter and Spring of 1996, eight observations of the DUSI professional development activities for mathematics and science teachers were made by mathematics and science educators from Wayne State University. The observations were made at elementary, middle, and high school levels. The researchers provided reports organized around questions addressed in an "Observation Protocol" which was jointly developed by the WSU researchers and DPS staff. The protocol focused on whether the professional development activities:

- were guided by a constructivist orientation toward teaching;
- addressed the Core Curriculum in mathematics and science;
- modeled a constructivist approach to the Core Curriculum;
- utilized manipulatives and hands-on activities;
- supported mathematics and science for all (equity).

Teacher and Student Surveys

A teacher survey was developed and administered in the Spring of 1996 to evaluate the current state and needs of the science and mathematics programs. The survey sections included items dealing with: 1) instructional practice, 2) adequacy of the curriculum, 3) staff development, 4) instructional facilities, equipment, and support, 5) parent and community involvement, and 6) enhancing student achievement and equity.

The student questionnaire was designed to evaluate: 1) the frequency of experience students had with various instructional activities in science and mathematics, 2) attitudes toward science and mathematics, and 3) awareness of and participation in extra-curricular science and mathematics activities.

This information provided by both teacher and student questionnaires was useful for assessing the impact of the DUSI as well as for providing baseline data for future comparisons. In addition, data from these surveys were useful for formative evaluation. Since this paper deals with professional development and its impact on classroom practice, the discussion of the results of these surveys will largely focus on the teacher survey sections #1-3 and the student survey sections #1.

Surveys were sent to a stratified random sample of 54 Detroit schools, stratified by school level (elementary, middle, and high school) and by tier (Tier 1, 2, and 3) which represented the degree of implementation of the systemic reform effort. All science and mathematics teachers within a school were asked to complete the Teacher Surveys (n=570). Students were randomly selected from fourth, eighth, and tenth grade homerooms from these same 54 selected schools to complete the Student Questionnaire (n=1080). Teacher and/or student surveys were received from 49 of the 54 schools for a 91% school response rate. Completed surveys were received from 289 teachers for a 51% estimated response rate and from 815 students for a 75% estimated response rate.

Focus Groups with Teachers and Unit/Department Heads

Three focus group sessions were held with three teacher groups and one session was held with unit/department heads. The focus sessions were conducted by two Wayne State University researchers. The focus group questions targeted the Core Curriculum and constructivist teaching/learning and were related to:

- participant awareness level
- implementation levels
- professional development opportunities to support implementation
- level of support received for implementation

Summer Institute Surveys

A key component of the DUSI Professional Development has been a three week summer institute for school teams of teachers and administrators. The institute, *Building Communities of Learners for Mathematics and Science Literacy*, accepted over 700 mathematics and science teachers in 1995 and over 800 in 1996. A constructivist orientation was central to the institute design. The participants were comprised of school teams of mathematics and science teachers and administrators across grade levels (K-12). The primary goal of the institute was to initiate and support learning communities of educators throughout the district. During each day of the institute, participants were involved in a variety of activities through which they could build collegial and supportive relationships with their peers. The format of the institute allowed participants to make personal choices to meet their individual

needs while simultaneously supporting the formation of learning communities to foster peer support.

During the institute, school teams read and discussed the DUSI vision document during a daily "team meeting" time. Presenters were also asked to familiarize themselves with this document and to consider how their sessions modeled and informed participants about the principles of constructivism. School teams were encouraged to connect what they were learning through focus sessions, keynote addresses, and workshops to the principles of constructivist teaching that were outlined in this vision document. It was believed that this alignment of activities would help to further DUSI goals. During the institute, school teams were asked to work together to create a "Team Action Plan" which would detail goals and implementation plans for their science and mathematics programs for the 1995-96 school year. Each school team submitted a team action plan at the end of the institute.

Several types of data were collected to examine the impact of the summer institute activities on institute participants. At the conclusion of the institute, a survey was administered to evaluate the effectiveness of each of the program components. Respondents were told not to identify themselves on the survey. The survey utilized a five point Likert Scale with a rating of "1" indicating "Strongly Agree" and a positive response while a rating of "5" indicated "Strongly Disagree" and a negative response. All items were positively phrased. The "Team Action Plans" developed by each school team participating at the institute were also utilized as a data source. Many school teams also provided brief reports that served to update the institute coordinators on the progress the team was making toward implementing their action plans and achieving their goals.

Case Studies of School Teams

To obtain information on the quality and nature of the changes reported by school teams who had attended the summer institute, eight school teams were selected for in-depth study. The schools were selected to mirror important characteristics of the summer institute teams. The majority of summer institute participants were elementary level educators. Thus, five of the eight case study schools were at the elementary level, with two case study schools at the middle level and one school at the

high school level. Each of the school teams had articulated changes that were occurring at their schools through interim reports.

The primary objective of conducting case studies of selected school teams was to obtain detailed evidence regarding the extent and the quality of change in the science and mathematics program as a result of the implementation of the summer institute team plan. Additionally, the researchers wanted to document obstacles or barriers encountered by the team and how they were resolved.

Science and Mathematics educators from Wayne State University conducted the case studies. These researchers were familiar with the summer institute goals, the Team Action Plans, and the DUSI Constructivist Vision document. Each researcher visited the school sites, held discussions with administrators and teachers, and made classroom observations. A semi-structured interview with school team participants focused on implementation of the Team Action Plan.

The methods employed in the case studies were interpretive (Erickson, 1986). Sources of data were transcripts of eight in-depth, semi-structured interviews of approximately one hour duration each and field notes of lesson observations, informal conversations, and observations of student work. The use of multiple data sources helped enhance the credibility of findings. Lincoln and Guba (1985) indicated that the use of multiple data sources in data analysis allows the researcher to test emerging assertions against the entire data set to confirm or refute those assertions. Compatible with the type of data yielded by these interpretive case studies, inductive analysis (Bogdan & Bicklen, 1992; Marshall & Rossman, 1989; Merrieam, 1988) was the primary method for analyzing the data. That is, the data were repeatedly examined to uncover salient patterns, singularities, and themes. Emergent relationships and assertions (or working hypotheses) were then generated. These assertions were tested for validity against the entire data set and reformulated as the analysis developed.

Results

Mathematics and Science educators from Wayne State University conducted eight formal observations of professional development activities. The observers

found that the professional staff development activities observed were guided by a constructivist orientation to teaching. Evidence presented to confirm this statement included: 1) staff developers posed open-ended, higher-order questions, 2) staff developers actively engaged participants in the learning process, 3) staff developers used small cooperative groups during their sessions, 4) participant's responses were solicited and valued, 5) staff developers modeled the kinds of approaches that they would have the participants themselves use in the classroom, 6) hands-on activities were an integral part of the staff development, and 7) staff developers attempted to connect the staff development to the participants' prior knowledge. Also, the observers agreed that the staff development activities addressed the DPS Core Curriculum in mathematics and science.

These observations supported the attempt of the DUSI to change the staff development program in mathematics and science so that it was more focused on State and national standards (embodied in the Core Curriculum) and so that it better supported a constructivist orientation to teaching.

Teacher Survey and Student Questionnaire Results

Seventeen items that best exemplified constructivist teaching practices were examined on the Teacher Survey. Teachers reported that they were using constructivist instructional practices weekly or more often 55% to 98% of the time depending on the item (Table 1). Likewise, over half of the teachers reported using constructivist assessment tools in their classroom weekly or more often (Table 2). These teacher reports were supported by responses from students on the Student Survey regarding the frequency of their experience with constructivist instructional practices in their science (Table 3) and mathematics (Table 4) classrooms and the frequency of experiencing alternative assessment in their science (Table 5) and mathematics (Table 6) classrooms. Overall, over one-half of the students reported experiencing the listed constructivist and alternative assessment practices either "sometimes" or "almost everyday."

These teacher and student survey results support the idea that teachers were implementing many elements of constructivist instructional practice in their classrooms. This might indicate that the DUSI professional staff development program has been successful in the first two years by helping teachers to move

toward a more constructivist orientation and to develop the skills needed to implement such instructional practice. The possible influence of the DUSI professional development program on changing instructional practice was supported by the examination of the teacher data on a tier or phase-in of the DUSI professional development program. Generally, the teachers from the earliest implementation phases of DUSI (Tiers 1 and 2 who received professional development under the DUSI program in 1995 and/or 1996) were more apt to use these constructivist practices almost daily in their classrooms than were teachers in Tier 3 schools who had not yet experienced the major impact of this professional development program.

When asked about the adequacy of the curriculum, with regard to certain constructivist elements, 50% or more of the teachers reported in the Teacher Survey (Table 7) that the science and mathematics curriculum was "adequate enough" (choices were "not adequate," "somewhat adequate," and "adequate enough") in making connections with State curriculum frameworks (50%) and that it articulated the skills (56%) and concepts (63%) that they wanted students to know. However, less than one-fourth of these same teachers felt the curriculum adequately enough related to the needs of urban students (23%), developed practical skills to use scientific instruments, calculators, and computers (23%), related to societal issues relevant to students (17%), and that prepared students for future jobs (17%). Evidence for change in teacher viewpoints about the adequacy of the curriculum as a result of DUSI activities came from a comparison of teacher viewpoints about the curriculum on identical items given to teachers in the Needs Study conducted in 1993 (before DUSI) and again in 1996 after about two years of experiencing the DUSI program (Table 8). Comparisons of teacher views at these two points in time were made using a series of one-way analysis of variance procedures which indicated that significant improvements were made after DUSI began. In fact, significant improvements were noted in all areas ($p<.05$) queried except for two items in mathematics. These results provide support for the contention that the DUSI efforts resulted in positive changes in making the curriculum more adequate.

In the staff development section of the Teacher Survey, the majority (93%) of teachers reported that as a result of the on-going professional development program they were at least "adequately prepared" (choices were on a five point scale from "not prepared"=1 to "well prepared"=5 with "adequately prepared"=3) to implement

the DPS Core Curriculum. Again, there was a significant difference ($p<.05$) between teacher responses by Tier. Nearly half (49%) of Tier one teachers reported they were well prepared for this implementation, compared to 41% of Tier two and only 32% of Tier three teachers. This provided further support for the idea that the DUSI professional development program had resulted in these differences. Tiers 1 and 2 had received the full staff development program, whereas, Tier 3 would not receive this program until the 1996-1997 school year.

Focus Groups with Teachers and Unit/Department Heads

Three focus group sessions were held with three teacher groups and one session was held with unit/department heads. In all cases, the teachers and unit/heads said that they were familiar with the Core Curriculum and the principles embodied in the Constructivist Vision Statement for the DUSI. Participants indicated that they became familiar with these documents through the professional development meetings and from their supervisors.

Teachers said that they used the Core Curriculum for finding out what they should expect their students to know upon entrance and exit from their program. Furthermore, they said that they were using the hands-on strategies described in the two documents (Core Curriculum and the Vision Statement) to construct and to implement a variety of activities that were laboratory and constructivist in nature. The activities that they used often reflected State and national assessment strategies. The role of the teacher here, they said, was as the facilitator. They suggested that classes be scheduled so that it would be more convenient for team/grade level planning and for department meetings so that teachers can interact more with one another and share techniques.

The unit/department heads felt that things were definitely better because of the DUSI professional development program. For example, one respondent stated, "We do have more teachers, especially those who attended the Summer Institute, who are trying to put those things in practice in their classrooms." As a result of the increased opportunities for staff development, another respondent stated, "people are more interested in technology." Also, these unit/department heads suggested that more released time during the work day was needed for intensive inservice education.

Summer Institute Survey Results

At the end of each institute, a survey was administered to institute participants. The survey results are shown in Table 9. The results indicated that institute participants believed that the institute was very worthwhile and that their was a strong likelihood that the Team Action Plans developed at the institute would be implemented during the following school year. Survey results also indicated that participants believed that they understood constructivism much better as a result of

their participation at the institute. The survey also demonstrated the perceived benefit of planning team meeting time into the summer institute program. Survey results indicated that participants believed that team meeting time (provided during the daily program) was beneficial and helped school teams with future planning. Furthermore, results also indicated that the team meeting time helped individuals think about components of constructivism.

Case Studies of School Teams

Evidence from the case study reports indicated that as a result of institute activities there appeared to be a greater emphasis on hands-on instructional approaches, integrating technology into programs, increasing parental involvement, instituting more cooperative learning, increasing the depth of understanding in content areas, and using a variety of assessment strategies to inform instruction. The case study reports delineated the school curriculum changes planned by the various teams, namely:

- School A focused on increasing students' understanding of estimation and measurement concepts;
- School B focused on increasing parental involvement;
- School C School focused on alternative assessment, technology and parental involvement;
- School D focused on increasing parental involvement, problem solving, self assessment, cooperative learning, and infusing technology;
- School E focused on shifting to more child-centered approaches to instruction and attending to issues of equity in mathematics and science;
- School F focused primarily on parental involvement and an increase in active learning strategies;
- School G focused on cooperative learning, the infusion of technology and increasing hands-on activity;
- School H focused on implementing the Core Curriculum and utilizing alternative assessment strategies.

These activities mirrored many of the components found in the constructivist vision document as well as the initial action plans formulated by the teams. Interview transcripts supported the impact of the summer institute on various components of constructivist teaching and learning. The teaching and learning

changes taking place that were most evident along with selected supporting data are found below:

Active, Student-Centered Teaching and Learning Activities:

> "One way that [constructivism in the team action plan] has been reflected is that we have put a greater emphasis in math and science on manipulatives. In science, we see teachers doing less reading of the textbooks and more investigation."

> "The summer institute really helped me to focus on giving the kids hands-on things to do, to inspire them to learn, to involve them in their learning and it demonstrated to me that this moves kids to higher levels of learning. When the children put their hands-on something, build something, construct something, they're actively involved in learning. That's when learning takes place. Being a new teacher it really helped me. It really helped me get a handle on and to focus on what I ought to be about the business of doing. How I really ought to direct the children and how I ought to facilitate their learning. Being a facilitator of learning, rather than lecturing from the book."

Increased Parental Involvement:

> "One of the things that happened, that was just fantastic was the Family carnival...Students started showing their parents how to do it [a graphing activity]. I think this is wonderful because it lets the parents see that 'Yes- my child is involved in school and I can help my child out at home.' That was a result of the summer institute that directly impacted this school."

> "I think parents are more excited about what's going on in our classrooms - what kids are learning and how they're learning."

Emphasis on Student Achievement in Mathematics and Science:

> "I wanted to show you that we have had a tremendous increase in our MEAP math scores this year [shows newsletter report]. We are involved in the Metropolitan Achievement Testing right now. And I think we will see some significant improvement in scores because of all the hard work."

Cooperative and Collaborative Teaching Strategies:

> "In my case, its a completely different approach [to teaching]...I use technology the best I can in order to get the kids to start their own learning by involving them. I'm not sure how much learning is taking place, that will come later, but I know everybody is involved because they all <u>have</u> to be involved. Not just through the pressure of my direction, but the peer pressure of being involved like everybody else. So you get more activity. And sometimes somebody else might come in and think it's noise, but it's not noise. I don't have much of that. For the most part if the noise is constructive and moving towards the objective, then it's doing what you want it to do. In my case that is a big change."

Importance of Professional Collaboration:

> "Team planning is excellent in this building. Everybody puts their heads together and thinks about what is we need to do and then they go ahead and do it."
>
> "A lot of times [the principal] has the vision and then we work together to make it happen. Most of the time her visions are good. A leader with a vision is most important."
>
> "The week before school opened we had a five day workshop with our teachers. One of the days, the team members who attended the institute presented all of the materials that we received. And we made copies. So even though most of our staff did not attend the institute, that information was disseminated."

Survey and case study results indicate that the summer institute may have helped participants implement changes at individual, classroom, and school levels. While the case studies provide information on only a small sample of schools, the results indicate that it is possible that even when school level changes are not evident, individual participants may still be profoundly affected and begin the change process on a personal level. This was evident in candid interview comments as shown in the example below:

> "In my classroom I think it's student activity - the student interaction. It's the biggest change in my room. I guess that change came from me. I didn't see the value of it too much before because I thought it was noise. I didn't think noise was productive. But I think different now from the workshop I went to. I talked with some of my colleagues, and watched what they do, and then I started...I think that was the biggest change for me - getting the students involved in their own learning."

Summary and Conclusions

Although there are many components to the Detroit Urban Systemic Initiative (DUSI), the infusion of extensive professional development opportunities holds great promise to positively impact classroom practice. Systemic evaluation of the DUSI is multi-faceted and targets a variety of outcomes. This study focused on the impact of DUSI professional development activities on actual classroom practice. Data was collected using a variety of methods including staff development observations, student and teacher surveys, school team case studies, and reports from teacher and administrator focus groups. Evaluation of professional development activities

revealed that the overall program was of high quality and tightly aligned with constructivist teaching and learning practices. Results indicated that teachers reported a significant increase in implementing constructivist teaching and learning practices that can be attributed to involvement in DUSI professional development activities.

Survey results indicated that there has been an increase, over the last three years, in the proportion of teachers who believe the curriculum adequately covers elements of constructivist teaching. The majority of teachers report that they implement this high quality curriculum on a regular basis. Student surveys provide concurrence on this point, with students reporting regular experiences with these constructivist elements.

Participants positively evaluated all aspects of the summer institute. Results of the institute evaluation provided evidence that participants believed they had learned a great deal about constructivism and that it was highly likely that individual School Team Action Plans, developed in context of constructivism, would be implemented during the following school year. The case studies provided valuable information about the nature of the reform activities at each site as well as key components of successful implementation, and barriers for change.

The results of this evaluation indicate that the Detroit Urban Systemic Initiative (DUSI) professional development program has had some positive impacts on the ways educators provided science and mathematics instruction to their students. Many urban, state, and national reform efforts are looking for ways to scale up to meet current professional development needs. As previously noted, the challenges faced by urban schools as they aspire to reform science education are immense. The ongoing evaluation of the professional development component of the DUSI may serve to provide other staff developers with ideas to support other large scale reform efforts.

TABLE 1
Teacher Report of Implementation of Constructivist Practices

Elements of constructivist implementation:	n	Percent indicating weekly or more
Connect instruction to student prior knowledge	279	98.4%
Use multiple strategies to teach concepts	277	96.5%
Implement the DPS Core curriculum	275	96.0%
Use group activities in which students work cooperatively in solving problems	278	92.8%
Assign performance tasks to help measure understanding and ability to apply what they have learned	275	92.2%
Use open ended questions	274	91.0%
Engage student in discussions about math/science	278	88.6%
Use models to represent concepts	275	88.1%
Use manipulatives where student discover principles and relationships	278	87.4%
Emphasize demonstration of an understanding of key math/science principles over memorization of facts and formulas	273	87.3%
Incorporate problem-solving & critical think opportunities	277	84.9%
Provide students opportunities to write about math/science	267	75.3%
Use projects to help observe students work	274	58.1%
Integrate multicultural perspective with math/science concepts	275	57.9%
Use peer reviews as a way of helping students become thoughtful critical assessors of their own work and that of others	274	56.9%
Maintain portfolios of student work to reflect growth over time and to document evidence of learning	274	55.5%
Provide opportunities for student to make choices and to plan, conduct and evaluate independent investigations	270	54.9%

TABLE 2
Teacher Report of Use Constructivist Assessment Tools

Aspect of Student Assessment	n	Percent Indicating "weekly" or more often
Assign performance tasks with all students to help measure understanding and ability to apply what they have learned	275	92.20%
Use open ended questions	274	91.00%
Provide all students with opportunities to write about math/science	267	75.30%
Use projects to help observe students at work	274	58.10%
Use peer reviews as a way of helping students become thoughtful, critical assessors of their own work and that of others	274	56.90%
Maintain portfolios for student work to reflect growth overtime and to document evidence of learning	274	55.50%
Use personal conferences with each student to reflect on progress, accomplishments, and new direction for student effort	275	53.10%

(Teacher Survey Source: Q.I.A.12,17,19,20,23,24,25)

TABLE 3
Students' Report of Frequency of Experiencing Constructivist Practices in their Science Class

Student Experiences in Science Class	n	Percent Indicating "sometimes" or "almost everyday"
Work with others in small groups	704	93%
Learn about science through real life situations	701	82%
Do hands-on laboratory activities	673	80%
Use models to represent ideas for concepts	678	79%
Use a work folder or portfolio	685	75%
Work on projects that take a week or more	688	72%
Write about science in a journal	690	56%
Make your own choices about what you study	692	53%

(Student Survey Source: Q.II.4,5,7,11,12,13,18,19)

TABLE 4
Students' Report of Frequency of Experiencing Constructivist Practices in their Math Class

Student Experiences in Math Class	n	Percent Indicating "sometimes" or "almost everyday"
Do activities to learn math	721	90%
Work with others in small groups	715	86%
Learn about math through real life situations	693	81%
Use a work folder or portfolio	708	72%
Use models to represent ideas for concepts	710	67%
Make your own choices about what you study	694	61%
Work on projects that take a week or more	708	56%
Write about math in a journal	702	54%

(Student Survey Source: Q.II.4,5,7,11,12,13,18,19)

TABLE 5
Students' Report of Frequency of Using Alternative Assessment In Their Science Class

Student Experiences with Alternative Assessment in Science Class	n	Percent Indicating "sometimes" or "almost everyday"
Talk with teacher about your progress	686	79%
Use a work folder or portfolio	685	75%
Write about science in a journal	690	56%

(Student Survey Source: Q.I.12,13,17)

TABLE 6
Students' Report of Frequency of Using Alternative Assessment In Their Mathematics Class

Student Experiences with Alternative Assessment In Mathematics Class	n	Percent Indicating "sometimes" or "almost everyday"
Talk with teacher about your progress	708	80%
Use a work folder or portfolio	708	75%
Write about math in a journal	702	54%

(Student Survey Source: Q.I.12,13,17)

TABLE 7
Teacher Report on Adequacy of Constructivist Elements of the Science/Mathematics Curriculum

Elements of the science/mathematics curriculum	n	Percent indicating "Adequate enough"
Outlines the major concepts we want our student to know and to be able to demonstrate	278	62.5%
Articulates the skills we want our students to be able to demonstrate	277	56.0%
Makes connections to the state curriculum framework	272	50.0%
Develops problem solving skills	272	46.8%
Organizes school mathematics and science programs around the standards identified for effective mathematics and science learning	275	43.0%
Develops a relationship between math, science and other disciplines	271	34.0%
Prepares student for a college education	277	32.1%
Identifies the attitudes or habits that we pride highly	259	29.2%
Provides equal access to all students for resources and programs for mathematics and science	269	28.2%
Prepares students for local and national science tests	272	27.9%
Relates to needs of urban students	271	22.8%
Develops practical skills to use scientific instruments, calculators and computers	272	22.8%
Develops technological science concepts	249	19.3%
Relates to societal issues relevant to the student	268	17.2%
Prepares students for future jobs	272	16.9%

(Teacher Survey Source: Q.I.B. 1-15)

TABLE 8
Change in View of Curriculum as Adequate From 1993-1996

	Math			Science		
Element of Curriculum	1993 n=123	1996 n=160	sign dif	1993 n=159	1996 n=127	sign dif
Develops problem solving skills	1.9748	2.3459	p<.01	1.8944	2.3906	p<.01
Develops a relationship between math, science and other disciplines	1.7480	2.1375	p<.01	1.7888	2.2835	p<.01
Relates to needs of urban students	1.7600	1.9560	p<.05	1.7778	2.0233	p<.01
Prepares students for a college education	1.9120	2.2201	p<.01	1.9000	2.1742	p<.01
Prepares students for local and national tests	1.9274	2.0705	n.s.	1.9074	2.1450	p<.01
Prepares students for future jobs	1.8400	2.0449	p<.01	1.7750	1.9845	p<.01
Develops practical skills to use scientific instruments, calculators and computers	1.9350	2.1188	p<.05	1.8037	2.0458	p<.01
Relates to societal issues relevant to the student	1.7236	1.8065	n.s.	1.7702	1.9766	p<.01

(1993 Teacher Survey Source: P.3.Q.1.)
(1996 Teacher Survey Source: Q.I.B. 6,7,8,9,10,12,14)
n.s.= not significant

TABLE 9
Survey Evaluation of Summer Institute by Teacher and Administrator Participants

Survey Item	Participant Group	Number of Teachers Responding	Average Rating*
The format of the institute was well designed (Focus Session, Keynote, Workshop, Team Meeting)	1	149	1.58
	2	213	1.46
	3	189	1.50
The form group session modeled constructivist teaching.	1	151	1.34
	2	221	1.38
	3	189	1.22
Team meetings were beneficial.	1	145	1.58
	2	221	1.43
	3	187	1.56
Team meetings helped us with future planning.	1	147	1.50
	2	220	1.35
	3	188	1.48
The likelihood of our team implementing the plan is very good.	1	145	1.58
	2	220	1.41
	3	188	1.49
Team meetings helped our team to think about components of constructivism.	1	148	1.53
	2	219	1.40
	3	187	1.44
I understand constructivism much better as a result of the institute activities.	1	148	1.41
	2	222	1.36
	3	189	1.36
Overall, the institute was a valuable experience.	1	148	1.23
	2	222	1.20
	3	191	1.27
If given the opportunity, I would like to attend this institute again.	1	147	1.25
	2	222	1.26
	3	187	1.27

*Note: A rating of 1 = strongly agree and a rating of 5 = strongly disagree

References

Ajzen, I., & Fishbein, M. (1980). *Understanding attitude and predicting social behavior.* Englewood Cliffs, NJ: Prentice Hall.

Anderson, R.D., & Mitchener, C.P. (1994). Research on science teacher education. In D.L. Gabel (Ed.), *Handbook of research on science teaching and learning.* New York: Macmillan.

Bogdan, R., & Bicklen, S. (1992). *Qualitative research for educators (2nd ed.).* Needham Heights, MA: Allyn and Bacon.

Bybee, R.W., & DeBoer, G.E. (1994). Research on goals for the science curriculum. In D.L. Gabel (Ed.), *Handbook of research on science teaching and learning.* New York: Macmillan.

Crawley, F.E., & Koballa, T.R. (1992). *Attitude/behavior change in science education: Part I-models and methods.* Paper presented at the annual meeting of the National Association for Research in Science Teaching, Boston, MA.

Cuban, L. (1979). Determinants of curriculum change and stability, 1870-1970. In J. R. Gress & D.E. Purpel (Eds.), *Curriculum: An introduction to the field.* Berkeley, CA: McCutchan.

Cuban, L. (1990). Reforming again, again, and again. *Educational Researcher, 19,* 3-13.

Deighan, W.P. (1992). *School-business-university collaborative: A new paradigm for urban education.* Paper presented at the annual meeting of the American Association of School Administrators, San Diego, CA.

Dlugosh, L.L. (1993). *Planning processing, and action leads to quality schools.* Paper presented at the annual conference on Creating the Quality School, Oklahoma, OK.

Donivan, M. (1993). A dynamic duo takes on science. *Science and Children,* 31 (2), 29-32.

Erickson, F. (1986). Qualitative methods of research on teaching. In M.C. Wittrock (Ed.), *Handbook of research on teaching* (pp. 3-36). New York: Macmillan.

Fullan, M.G., & Miles, M.B. (1992). Getting reform right: What works and what doesn't. *Phi Delta Kappan, 73,* 745-752.

Gordon, R. (1993). *The irrational science of educational reform.* Paper presented at the annual meeting of the American Research Association, Atlanta, GA.

Haney, J.J., Czerniak, C.M., & Lumpe, A.T. (1996). Teacher beliefs and intentions regarding the implementation of science education reform strands. *Journal of Research in Science Teaching, 33* (9), 971-993.

Haney, J.J., & Lumpe, A.T. (1995). A teacher professional development framework guided by reform policies, teachers needs, and research. *Journal of Science Teacher Education,* 6 (4), 187-196.

BEST COPY AVAILABLE

Holmes Group. (1986). *Tomorrow's teachers.* East Lansing, MI: Author.

Holmes Group. (1995). *Tomorrow's schools of education.* East Lansing, MI: Author.

Jacobson, W.J., & Doran, R. L. (1991). *Science achievement in the United States and sixteen countries.* New York: The Second International Science Study.

Jenlink, P. (Ed.) (1995). *Systemic change: Touchstones For the Future school.* Palatine, IL: IRI/Skylight training and publishing.

Keys, C.W., & Golley, P.S. (1996). The power of a partner: using collaborative reflection to support constructivist practice in middle grades science and mathematics. *Journal of Science Teacher Education,* 7 (4), 229-246.

Lincoln, Y., & Guba, E. (1985). *Naturalistic inquiry.* Newbury Park, CA: Sage.

Marshall, C., & Rossman, G. (1989). *Designing qualitative research.* Newbury Park, CA: Sage

Mathematical Association of America. (1991). *A call for change: Recommendations for the mathematical preparation of teachers of mathematics.* Washington, DC: Author.

Mullins, I.V., & Jenkins, L.B. (1988). *The science report card: Elements of risk and recovery.* Princeton, NJ: Educational Testing Service.

National Commission on Excellence in Education (1983). *A nation at risk: The imperative for educational reform.* Washington, DC U.S. Department of Education.

National Council of Teachers of Mathematics. (1989). *Curriculum and evaluation standards for school mathematics.* Reston, VA: Author.

National Council of Teachers of Mathematics. (1991). *Professional standards for teaching mathematics.* Reston, VA: Author.

National Research Council. (1996). *National science education standards.* Washington DC: National Academy Press.

Raizen, S., & Miachelsohn, A. (1994). *The future of science in elementary schools: Educating prospective teachers.* San Francisco, CA: Jossey-Bass Publishers.

Ramirez-Smith, C. (1995). Stopping the cycle of failure: The Comer model. *Educational Leadership, 52* (5), 14-19.

Rubba, P.A. (Ed.) et. al. *Excellence in educating teachers of Science.* The 1993 Yearbook of the Association for the Education of teachers of Science. Columbus, OH: ERIC.

Sashkin, M., & Egermeier, J. (1992). *School change models and processes: A review and synthesis or research and practice.* Working paper from the Office of Educational Research and Improvement Programs for the Improvement of Practice (#PIP-WP-92-9). Washington, DC.

Shroyer, G.M., Wright, E.L., & Ramey-Gasser, L. (1996). An innovative model for collaborative reform in elementary school science teaching. *Journal of Science Teacher Education, 7* (3), 151-168.

Sparks, D. (1994). A new form of staff development is essential to high school reform. *The Educational Forum, 60* (3), 260-266.

Sparks, D., & Loucks-Horsley, S. (1990). Models of Staff development. In W.R. Houston, M. Haberman, & J. Sikula (Eds.), *Handbook of research on teacher education* (pp. 234-250). New York: Macmillan.

Stein, M., Edwards, T., Norman, J., Roberts, S., Sales, J., Alec, R., & Clay-Chambers, J. (1994). A constructive vision for teaching, learning, and staff development, pp. 1-27. (ERIC Document Reproduction Services no. 383-557).

Tippins, D. et. al. (1993). Reconstructing science teacher education within communities of learners. *Journal of Science Teacher Education, 4* (3), 65-72.

Tobin, K., Tippins, D.J., & Gallard, A.J. (1994). Research on instructional strategies for teaching science. In D.L. Gabel (Ed.), *Handbook of research on science teaching and learning.* New York: Macmillan.

Weir, S. (1992). *Electronic communities of learners: Fact or fiction.* Cambridge, MA: TERC.

Woodrow, D. (1992). Learning from experience: Some principles of inset practice. *Mathematics in School,* 20 (4), 11-13.